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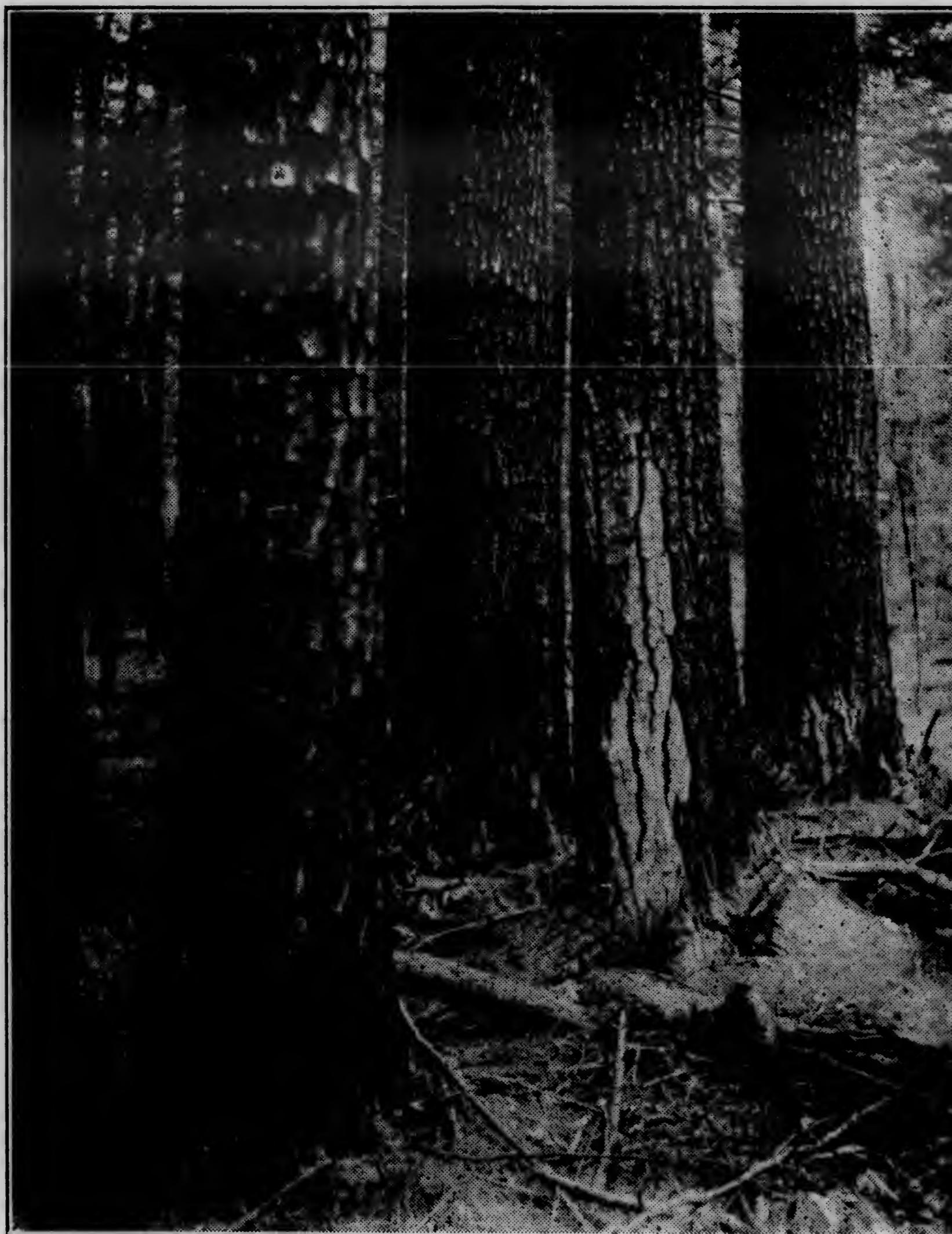
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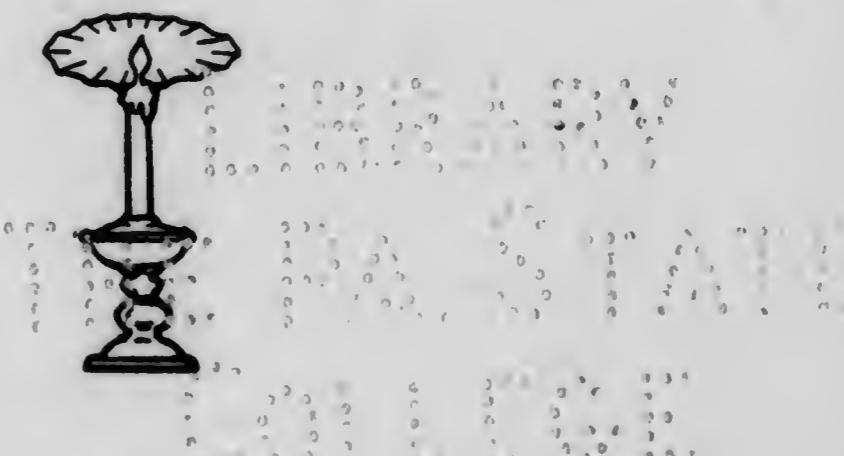
Existing Virgin Pine Approximately 300 Years Old, still standing and should not be cut.

The Present and Future of
Pennsylvania's Forests

—BY—

HON. S. B. ELLIOTT

A MEMBER OF THE
FORESTRY RESERVATION COMMISSION OF THE
STATE OF PENNSYLVANIA.



PUBLISHED BY
THE PENNSYLVANIA CONSERVATION ASSOCIATION

1916:

DUBOIS COURIER PRINT

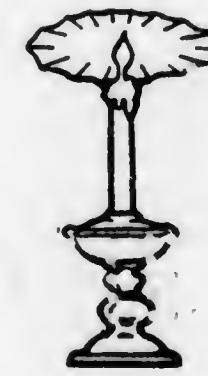


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The Present and Future of Pennsylvania's Forests

Reynoldsville, Pa., July 15, 1916.

Mr. A. B. Farquhar,
Pres't. Penn. Conservation Association,
York, Pa.

Dear Mr. Farquhar:

The purpose and efforts of the Pennsylvania Conservation Association to conserve the natural resources of our state certainly challenge the respect and admiration of every patriotic citizen of our Commonwealth; and its earnest endeavor in that work should have no formidable competitor for public regard. As we all know—from their use and very nature—these natural resources are fast vanishing, and only one of them, the forests, can be restored when once exploited or consumed. Therefore, looking forward to the perpetuity of the forests, I have carefully prepared, and present for your consideration, the following summary of their past and present condition, coupled with suggestions of measures which I deem must be taken for their restoration and perpetuation, fully trusting to your good judgment for such use of it as you may choose to make.

Sincerely yours,
S. B. ELLIOTT.

Mr. M. I. McCreight, Treas.,
Penn. Conservation Association,
DuBois, Pa.

Dear Mr. McCreight:

I have just read Mr. S. B. Elliott's admirable paper on forestry, and most cordially approve its being printed and distributed by the Pennsylvania Conservation Association. I regard it as the ablest treatise on forestry that I have yet seen. The information it contains should be in the hands of all the people of our State, since the preservation of its forests is essential not only to its aesthetic beauty, but to its very life, prosperity and progress.

Yours very truly,
A. B. FARQUHAR.
Pres. Penna. Conservation Association.

Letter from Dr. J. T. Rothrock, President of the Pennsylvania Forestry Association, Past-Commissioner of Forestry for Pennsylvania, and Vice-President of the American Forestry Association.

I have read Mr. Elliott's paper on the "Present and Future of Pennsylvania's Forests." It is a most timely, useful and reliable presentation of the subject, and in my judgment should be printed and widely circulated in this State.

His treatment is admirable of the pernicious idea that forests of commercial value, such as we once had, would be spontaneously restored on our waste land if the forest fires were suppressed:—a theory false in fact and dangerous in its tendencies and growing out of ignorance of existing conditions.

J. T. ROTHROCK.

Letter from Dr. Henry S. Drinker, President of Lehigh University, Past-President of the American Forestry Association, Vice-President of the National Conservation Congress, Member of the Boards of Directors of the Pennsylvania Conservation Association and of the Pennsylvania Forestry Association.

Mr. Elliott has paid me the compliment of showing me his paper on Forestry, before its publication, and has asked my opinion in regard to it. It gives me great pleasure to say that it strikes me as one of the best summaries on forestry that has ever been written. I greatly hope that it can be published, particularly for the information of the members of our next Legislature, so that the valuable information it contains may be at their service in the effort to maintain the State of Penna. in the leading position it has always held in the great and important question of the wise conservation and reproduction of our forests.

HENRY S. DRINKER.

Letter from Dr. Edwin E. Sparks, President of Penna. State College.

Mr. S. B. ELLIOTT,
Reynoldsville,
Pennsylvania.

My Dear Mr. Elliott:

Your inspiring article on the Present and Future of Forestry in Pennsylvania, should be printed so frequently and in such large type that every thoughtful citizen could read and digest fully its forceful conclusions. You have a vision not of the present but of the future. If only you could get the public sentiment aroused to action, your words would truly live after you.

With best wishes, I beg to remain

Very truly yours,
EDWIN E. SPARKS.

PRESENT AND FUTURE OF PENNSYLVANIA'S FORESTS.

As it is my purpose so will it be my endeavor, truthfully and without bias, to set forth, as far as possible, the area of both virgin and cut-over forests within our state; to make known the havoc that their wide-spread exploitation has wrought; to point out their actual present condition; to show how restoration should be undertaken; to indicate what can be done to restore and perpetuate them; and to suggest who can and who should alone engage in and carry it on, or should aid others in the restoration.

Much misapprehension exists in the minds of the people regarding not only the present status but, likewise, the economic features embraced in the probabilities of the forests of the future; and especially so is it in the matter of their renewal and perpetuity. While it is unfortunate that such misapprehension prevails concerning these features it is but truth to say that it should not be charged wholly, nor even largely, to a lack of interest in the present welfare of the state or in its future prosperity. It undoubtedly originated from a one-time superabundance of forests, and finally became a prevailing, but unwarranted belief that Nature not only can but actually does continue to promptly restore them without the aid of man, if he will only save them from fires for which he is responsible.

It must be admitted that there is little ground for wonder that so many people have conceived the idea that natural restoration will occur on the cut-over and burned-over land when they can see a growth of some sort of trees coming on where a forest of valuable species had recently stood, or in assuming that trees of the same species will be restored there in ample number and in as good condition as formerly. Feeling no particular interest in the matter they see little or no need to concern themselves and hence they do not investigate conditions nor ascertain whether the species of trees they see there are of any worth as producers of useful forest products; or if so, whether they are sufficiently numerous and in such condition that they will ever become available for such purpose; while the real fact is that if they would investigate and, moreover, should be possessed of an enlightened comprehension and understanding of what species of trees should be found there, and the number and character required to produce a valuable forest, they would see that, in the main, the stand they will find is practically worthless and wholly unfitted for such purpose.

To correct this wide-spread erroneous belief and unfortunate attitude of indifference, by showing actual conditions and requirements, coupled with suggestions of a course which should be pursued, is the task I have assigned myself; and in the performance of that task I will endeavor to be as concise as the importance of the subject will permit; but that importance demands the invasion of a pretty broad field. I shall aim to be conservative both in detailing conditions and in showing the necessity for prompt action; yet should the truth be disappointing will not hesitate to utter it, not believing, as did a prophet of old, that the people desire that only "smooth things" be said unto them when their interests demand the full facts; and I also will endeavor to set forth such facts that all may see that what is said is purposive only and that such purpose is the early restoration and succeeding perpetuity of the forests of the Commonwealth.

Past and Present Forest Area.

The last United States census gives 28,692,480 as the number of acres contained within the boundary lines of the State of Pennsylvania; and as nearly all of that domain is dry land it is safe to conclude, after deducting stream-beds, swamps, barrens, and declivities too steep or rocky for tree-growth, that, at the time the charter was granted to William Penn, there was not less than 95 per cent. of this area covered with trees unsurpassed in variety and character of species adapted to economic use. While areas have been found elsewhere which yielded more to the acre none have been discovered that equaled Pennsylvania's forests for usefulness. That all this land, including forests and minerals, was sold for the insignificant price of 26 and 2-3 cents per acre seems a strange proceeding when contrasting it with the subsequent, but comparatively recent, purchase by the State of a trifle over 1,000,000 acres of this same land, stripped of nearly all merchantable tree-growth—and a great deal of it entirely so—at an average price of \$2.25 per acre—and doubtless considerably more will be secured in the future at such prices as may prevail.

The census returns show that of the 28,692,480 acres—the state's total area—18,586,240 acres are classed as "farm land", leaving a balance of 10,106,240 acres for which no claim whatever is made that it is or can be used for homesteads or for profitable agriculture. But the same returns show that of the 18,586,240 acres set down as "farm land" only 12,673,519 acres of that area are classed as "improved land", showing 5,912,721 acres—almost one-third of it—as uncultivated. Now, "improved land" must mean cultivated land only, for, according to the dictionaries, to improve land means "to ameliorate by care and cultivation"; "to make better, to improve the value, worth, goodness or power of"; "to make better, to improve land by careful cultivation"; but in the returns, as given by the farmers or owners, no doubt "improved land" means only such land as is subject to tillage by the plow, or is cleared of all tree growth and kept for pasture. But on most farms there is more or less land partially cleared and used for pasture, but is not adapted by Nature for the plow, or it is kept in woodland for farm use, or is not cleared of tree-growth because unfitted for cultivation—yet most of it has been cut-over once or twice and probably burned-over several times—and such land constitutes the difference, as returned, between the "farm land" and "improved land," which, as shown, amounts to 5,912,721 acres.

To reach any estimate whatever of the land legitimately belonging to agriculture, and so used, we are forced to indulge in some guess-work; therefore, in order to arrive at something which may be considered as approximately near the fact, we will assume that one-half of this 5,912,721 acres—or 2,956,360 acres—legitimately may be classed along with the "improved land", for it is used as such in a manner, thus making the "farm land" 15,629,879 acres, leaving the other half to go with the 10,106,240 acres, for which there is no classification; hence these two amounts must be set down as non-agricultural land, making a grand total of 13,062,600 acres, or a little less than 46 per cent. of the total area of the state that is not nor can any appreciable amount of it be used for providing homes or food for the people. Thus it will be seen that those who claim that not more than one half of the State's area is fitted for profitable agriculture are not far wrong, if at all so, in their estimate;

for it is plainly manifest that on nearly every farm there is more or less land which brings the owners no returns commensurate with the amount which they must incur in interest, taxes, and care of it; and the owners would be better off if such areas were not theirs, for, as managed now, they are an actual incumbrance; hence it is a grave question if there is not quite a large area of land in our State now used, after a fashion, for agriculture, which does not legitimately belong to that class, but should be rated as non-agricultural territory.

Undoubtedly there is a comparatively small amount of this 13,062,600 acres, mixed in here and there throughout some portions of the State, that eventually can and will be used for pasture, and this is especially so where the valleys are those caused by erosion instead of upheaval, for the steep hill- and mountain-sides in the former frequently have fertile soil but the surface is so steep that tillage would be difficult, and, besides, if undertaken would bring about inevitable destructive erosion. But little of such land is yet used for any profitable purpose nor will it be until the time arrives when density of population makes it necessary, or farmers in such localities resort to sheep raising, for which use such land is better fitted than for any purpose except tree-growing; and unless used for one or the other of these must lie unproductive. Any claim that clearing forest land for the purpose of agriculture is being carried on now in our State to any appreciable extent, is offset by the unquestionable fact that there is now more land once used for that purpose being abandoned and left to become wild, than there is being cleared.

Furthermore, it is true that besides such areas as have just been noted there is some small portion of the land classed as non-agricultural that is fairly fitted for cultivation, but it is in small patches and these so far apart that families occupying them would be so isolated and far from neighbors as to preclude the possibility of maintenance of schools, churches, and other necessities of civilized life required for modern communities.

If restoration of our forests should be systematically undertaken then these isolated areas could be utilized, for they would be needed as places of occasional, or, in some instances, as places of permanent residence of those engaged in that work, but if not so used would serve, and with no loss to the State, as ground upon which future and much needed forests could be grown.

Land Not Adapted to Agriculture, But Which Will Grow Trees.

Here we have, then, 13,062,600 acres—a trifle less than 46 per cent. of our total area—which by no stretch of the imagination or expanse of optimistic view, can be called productive agricultural territory; nor is any appreciable amount of it ever likely to be occupied as homesteads or be profitably devoted to growing food for the people; and what to do with it is a problem for the people of the Commonwealth to solve; and to wisely determine what best use it can be put to we should first know something of its past and especially its present condition.

As already stated, it originally was covered with a full stand of valuable species of timber trees. It was the poet's "forest primeval." Precisely how much remains untouched, that is, real wild-wood or virgin forest, is out of the question to now determine with any satisfactory degree of accuracy. No rec-

ords have been kept, and hence, full statistics cannot be obtained. At best all estimates must be largely conjectural, but to secure all information possible as to the amount remaining untouched diligent inquiries have been made of lumbermen—and these are likely to know and be the best informed—and there cannot be found, aside from small areas which have been kept on farms, through sentiment or other motives, more than 96,000 acres of wholly unexploited virgin forests remaining in our State; and according to admissions of the owners of three-fourths of that amount, that portion is being reduced annually at the rate of 5,000 acres; which will give an approximate idea of how long it will last. But to be safe, and such estimate should include all such land, whether on farms or elsewhere, we will place the sum total at, say, 200,000 acres, and at the present rate of cutting that will be gone in 30 years.

If the ratio of the remaining virgin forests to all that which has been cut over and burned-over should prove to be the same on the whole of the 46 per cent. of area, as it is on that which the State has purchased, the total would be small indeed, for it is doubtful if there can be found on the State's holdings of a trifle over 1,000,000 acres, as much as 250 acres of genuine untouched forest. But the State has not been purchasing virgin forests; nor should it engage in that business. The purpose of State-purchase is to secure, if possible, land with immature trees of valuable species, and in the absence of land with such trees on it, then to obtain land on which such trees can be planted. The State should not, nor is it the policy to own and keep mature forests, but it should grow new ones, and, when mature, dispose of them for the benefit of the people. Hence the amount of virgin forests on State land should be no guide in estimating the area of virgin forests still standing elsewhere; but the vast expanse of land—once covered with splendid trees, but which is now mainly destitute of all valuable growth, and has on it only worthless stuff, such as trembling aspen, fire cherry, scrub oak, sumac, etc., or is entirely barren of trees of any kind—that can be seen throughout the mountain and heretofore timber-producing regions of our State, attests the fact that there is little unexploited forests remaining in our State.

The prospective conditions of this large area will be considered later on, when its present state and the best methods of restoring it to something of its former productiveness will be discussed. But, as having a bearing on the necessity and advisability of its restoration, it will be best to ascertain what are the disastrous results, if any, which have followed the wide-spread exploitation and consequent destruction of the forests of the State; for if the resultant effects of such exploitation have not been detrimental to the interests of the people of the Commonwealth, then there can be little or no justification for the expenditure by the State of a large sum of money—already over \$4,625,000—for administration, purchase and care of the 1,000,000 acres it now owns, with continued annual expenses, outside of any purchase, of about \$300,000, and a much larger sum in the future if the policy of artificial reforestation should be seriously entered upon. While the restoration of our forests has its aesthetic and sentimental sides, and their importance cannot be denied, it, likewise, has its more important economic features, and these must be mainly dominant.

Showing Excellent Condition of Valuable Standing Timber Trees, which should be Preserved.



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Results of Forest Exploitation and Destruction.

What, then, has resulted from forest exploitation and destruction? To systematically determine this, it will be best to name such results in the order in which they have been recognized. Attention to the consequences of exploitation, and its resultant practical destruction of the forests, was first aroused over the impaired beauty of the landscape. It was being greatly injured in many places, and in others completely destroyed. It was observed that fires quickly followed the axe of the lumberman, in fact were frequently set by him, and substantially all tree-growth there was wiped, for a time, from the face of the earth, and nothing but charred stumps, barren soil, or rocks, greeted the eye; and the observer's sense of beauty was shocked. It was felt, and that conception is still dominant, that a country without forests was not "a thing of beauty and a joy forever." A love of forests has undoubtedly existed in the breast of man from his savage up to his civilized state and is continually becoming stronger and should not now be ignored. As forest destruction was limited, at first, to comparatively small areas, no great amount of protest was manifested, but as the destruction went on—and with frightful rapidity, too, for whole mountain ranges and vast plateaus were soon robbed of their mantle of green—there was loud remonstrance, and now that forest destruction has become wide-spread that feeling has grown more acute; nor is it felt by a few people only but by nearly all.

Disturbed and Disastrous Water Flow.

The next serious injury caused by the removal of the forests was not so readily recognized as consequent upon that occurrence. It was some time before the people at large associated the disturbed flow of springs and streams with the destruction of the forests; but the lumberman who operated his saw-mill by water power—and that was the case with a great majority of them in early days—soon found that he was afflicted with low stages of water at times and again with destructive floods. It did not take him long, however, to ascertain the cause; yet the people living along the streams far below where the forests were being cut could not so readily understand why disastrous floods, never before experienced, were so frequent; nor why the creeks and rivers no longer furnished uniform and continued water power for the industries along their banks; nor why their property was being destroyed by floods, as never before; and so, too, the farmer who had built his house close to a copious spring could not see, at first, why it should partially or completely fail at times. But in due time he and all the others realized that the destruction of the forests on the ground from which the supply of water came was the cause of the trouble. In addition the fisherman found his favorite streams in either riotous tumult or of such diminished flow as to present, in many places, only dry beds; neither was there protection from the glaring sun which fish life demanded. Nor was this all; for at this day we recognize, throughout the length and breadth of our State, not the shadow nor the echo but the substance of the injury done to the supply of potable water brought about by the destruction of the forests.

At last the feeling that something was wrong became so general that, acting upon that conception, the legislature in 1893 passed an act—I quote

from the act because it was the forerunner, and in fact, the foundation upon which our Department of Forestry is based—creating a commission “whose duty it shall be to examine and report upon the conditions of the slopes and summits of the important water sheds of the State for the purpose of determining how far the presence or absence of the forest cover may be influential in producing high and low water in the various river basins.” The commission did its work well and reported.

The cause of the disturbed flow of streams was made so plain in this report that the legislature, in 1895, created a Division of Forestry in the Department of Agriculture, with a Commissioner of Forestry, and in 1897 authorized the purchase of land for forestry reservations for the following specifically declared purposes:—“The lands so acquired by the Commonwealth shall become part of a forestry reservation system, having in view the preservation of the water supply at the sources of the rivers of the State, and the protection of the people of the Commonwealth and their property from destructive floods.”

As will be seen the public, by this time, had become aware of the cause that so seriously and disastrously disturbed the normal flow of the springs, creeks, and rivers of the State. Subsequent legislation—approved Feb. 25th, 1901—created the present Department of Forestry, but did not change or modify, nor has any other legislation indicated any other purpose or work that the Department should engage in. This neglect may lead to serious results. Of course we all know that a restoration of the forest cover at the sources of the rivers of the State is necessary for the protection of the people and their property from destructive floods, but we also as fully understand that protection from floods is not all the benefit to the public at large that a restoration of the forests would bring about; nor is it the only important one, for there are more people who need forest products than there are who need protection. While the Department is doing a large amount of work for the undoubted welfare of the people of the Commonwealth it should be understood that much of that work is outside of the defined purposes for which the Department was created; and such work must be legalized by the legislature, at each session, in the acts appropriating money for the use of the Department. There should be a remodeling of the organic law clearly defining the purpose and work of the Department which experience and a better understanding of conditions show to be necessary; and the sooner that is done, the better, for as the law now stands, it is optional with the Department to either continue the work it is now doing outside of that prescribed in the act quoted, or discontinue it and labor only “to protect the people of the Commonwealth and their property from destructive floods.” A change in administration, or even in the personnel of the Department, could cause a discontinuance of a great deal of the good work now being carried on and thus practically tie up, if not wholly waste, a large amount of money already expended, and change the policy from one of restoration to one of protection only.

Erosion of Soil Consequent Upon Destruction of Forests.

But the injury to property along the streams, caused by the destruction of the forests, was not the only mischief that water did. It was observed, in

due time, that at the time of floods, and of even quite moderate rains, the water in the streams was discolored and filled with more or less sediment, more so than formerly, and it was but natural to inquire where this silt and sediment came from. Investigation showed that it came mainly from land denuded of its forest cover and over which fire had run. It was composed of leaves, wood, and bark that had fallen on the forest floor and decayed. It was the humus of the agriculturist, that which, when mixed with the decomposed rocks, formed the fertile soil, and had been thousands upon thousands of years accumulating. Before the forest was removed, it held back the water from rains and melting snows and gave it time to penetrate the ground and gradually supply the springs and streams, as well as to hold it from impetuously rushing into the ravines and stream valleys, and by its precipitancy and violence causing destructive floods. Fire which had succeeded the removal of the trees had destroyed the coarser part of the mould, leaving, in the main, the finer and richer portion exposed to the action of the rains and melting snows, and this was carried into the streams. While this devastating work was going on—and it is still at work—those well informed in forestry history had come to a knowledge of what has resulted, under similar circumstances, in a large part of China where, in devastated regions, it has rendered such localities unable to support a population of any notable number; and in southern France where erosion, occurring within less than 100 years after denudation of the land through destruction of the forest, has cost the government over \$30,000,000 to arrest it, and the end is not yet reached; but in doing this France restored a forest covering on more than a million acres. Of course only one result can follow erosion of the soil when the forest cover is removed and fire allowed to succeed. If not arrested, and its recurrence made impossible, the soil's fertility will, in time, be exhausted and the region so affected become nothing better than a desert. Fires and erosion have already made reforestation difficult in some localities of our State, and in others have rendered it so impracticable as to preclude its economic attempt.

Extinction of Industries and Lessened Valuation.

While it is true that forest exploitation for a time created industries in the line of harvesting and manufacturing in one form or another, it is also true that a large portion of those industries have vanished, and the regions where they once existed now know them no more. Large areas, alive with laboring men while the forests were being destroyed, are now able to support only a sparse population; nor will conditions there be improved in centuries, if ever, unless measures be taken to restore the forests. In many places enterprising towns sprung up with schools, churches, stores, electric lights, water works, and many other things needed in our modern civilization, and many of such towns and industries have disappeared; in fact some of the localities where they once stood show only a barren waste, every building having been removed. While forests existed sufficient taxes could be levied to build and maintain roads, support schools, and meet township and county expenses; but the value of the land is so lowered that some townships and counties find it hard to meet expenses, owing to the lessened valuation within their limits. There is absolute danger of some counties becoming insolvent, or going into practical

bankruptcy with a resultant fate of being annexed to their bordering neighbors.

Destruction of Wild Life.

Furthermore, there is another loss that the destruction of the forests has caused that some may not deem of much importance but which, when carefully and rightly considered, will show to be no unimportant feature. The destruction of the forests has well-nigh destroyed the homes of wild life. Both birds and four-footed wild animals have greatly lessened in numbers, and unless something is done to provide them homes, they are on the way to ultimate extinction; and in the case of the birds their loss will be irreparable. We have no moral right to deprive these winged denizens of the forest of their homes. They are not our enemies, but our friends. We also well know, from resultant interference with the equable flow of our streams, that the food fishes which were once abundant are fast disappearing, while the State is expending no small sum of money to maintain their existence, as well as in doing that for maintaining the existence of air-breathing wild life. Too much of the pleasure and profit of the sportsman has passed away.

Lessened Supply Has Increased Cost and Degraded Quality of Forest Products.

We are now beginning to see what forest exploitation and destruction has cost in the past, and is costing now and must cost in the future, if conditions remain as they now are. It is an old but still suggestive saying that "one cannot eat his cake and keep it," and that saying can be applied to the use of the forests. If we continue to consume, or otherwise destroy them, and make no effective effort to restore them—for they do not grow as fast as we consume and destroy—there certainly will come a time when we will have none; for however foolishly we may now think them inexhaustible facts show that they are not so. Besides this we well know that the scarcity of any necessary commodity increases the price; for the law of demand and supply governs. And now not only have the prices of forest products been largely increased of late, but the quality of such products has greatly deteriorated. More is now paid for some of the lower grades of lumber than was paid for the highest a score of years ago; and some of the lower grades of the present time were not formerly deemed of any value whatever and were destroyed at the mill or thrown into the stream to lodge and deflect the current or cause injury otherwise. Scarcity and new uses for wood have caused the change. Moreover, we are using more and more forest products, throughout the whole country, as the years go by, than formerly. In 1880 there was consumed in the United States 350 feet, board measure, of wood per capita; in 1910 over 400 feet, in spite of the fact that the price of lumber had greatly advanced in that time. As every one knows our population is rapidly increasing and we shall continue to need more forest products annually, even should we lessen the per capita consumption. The claim that the people of this country can go elsewhere for a supply of forest products is not founded on a knowledge of world conditions. Nearly every country in the civilized world is experiencing a shortage; but if we could go elsewhere can we afford to pay the cost? or if the amount in other countries were adequate

to supply themselves and us would it be wise to place our destinies in the hands of others, however friendly they might be for the time being? Under most favorable conditions transportation added to monopoly prices would make such a solution of the supply problem an expensive one.

Present Forest Conditions.

However, discouraging may appear this presentation of what the destruction of our forests has brought to our doors, we should not look upon the situation as hopeless or without a remedy, for it is neither. We must not forget that the forests—and in this they are unlike all of our other natural resources—can be restored after being exhausted, and there is no good reason why we should not see that they are restored as far as is necessary and practicable. But before entering upon a discussion of how restoration can be accomplished, it will be well to have a clear conception of present conditions; and having that we more accurately can determine what best should be done, and adopt the most practical way to enter upon the work; for we may, and I have little doubt but that we will, find ourselves like a merchant when he settles with himself—as all good business men do—with a lot of valueless goods on hand and many accounts which must be charged off as worthless.

As already shown the "farm land" of the state amounts to 15,629,879 acres, and of course the forests are supposed to be permanently removed from this nearly 55 per cent. of its area, and hence no farther mention need be made of that portion; yet doubtless considerable of it is not well adapted to that use. But what of the remaining 13,062,600 acres—a trifle over 45 per cent.—which cannot be devoted to profitable agriculture? Probably five per cent. of it is occupied by towns and cities, or is covered by rivers, lakes, and swamps; or consists of rocky declivities and other regions where forests cannot be maintained—and this would mean 653,130 acres—leaving 12,409,470 acres, which is a trifle less than 44 per cent. of the state's whole area, to be devoted to some useful purpose other than agriculture.

I am well aware that in detailing the actual conditions prevailing on this nearly one-half of our State's domain I shall run counter to the generally entertained opinions of a vast majority of our people, and even by some may be deemed a defamer of our State and a traducer of its economic conditions. Nor will this disagreement and criticism come wholly from those who do not profess a knowledge of the functions involved in forest restoration; but, rather from some who have made forestry a study, but at long range, and who are guided too greatly in their conclusions by text books or statements in newspapers which deal with mature European forests where conditions are widely different from those existing here; in other words, from those who have not come in close business contact with actual conditions in the varying forest areas of our State that large experience as a lumberman and a careful, earnest and long-continued study, begot of natural inclination and official duties, have fallen to my lot. But that matters not; the facts should be known, for the "lion in the path" leading to reforestation of our cut-over and burned-over lands is a lack of understanding actual conditions.

Of this nearly 44 per cent. of non-agricultural land there probably remains, as before suggested, approximately 200,000 acres of untouched, virgin wildwood, and it should not be forgotten that this is being exploited rapidly, and so thoroughly is it done that little or no growth of valuable species is left. All the rest of our so-called forest area has been cut-over once and some of it twice, and practically all burned-over once and much of it several times, so often that there now is left little upon it from which a forest of valuable species can grow, while some considerable portion of it, as before stated, has nothing better on it than fire cherry, trembling aspen, sumac, scrub oak and other worthless stuff—all utterly valueless for forest products—and some with no tree growth whatever, only briars, weeds, and bracken; or it is wholly destitute of vegetable growth and suffering from erosion. How much there is of each of these classes, it is impossible to ascertain, but there is vastly more of the absolutely worthless class, that without any valuable trees thereon, than the cursory observer would naturally imagine unless he should go on the ground and make careful, intelligent inspection.

Of course there are many places where, prior to some 35 or 40 years ago, the lumberman cut only the best and largest trees, seldom taking any as small as 12 inches in diameter, but more generally leaving all under 15 inches. If the trees that remained on such tracts were not destroyed by succeeding fires, or were not thrown down by the wind, or did not die from changed surroundings—any one of which events is always liable to occur, and too frequently one of them did—and, moreover, if the trees were in a dense stand and not diseased, fire-scarred, low-limbed, forked, or crooked, there has come on, in good time, a growth of trees that furnishes good lumber and other forest products; and this sort of forests, if uninjured, are the ones which the lumberman has again gone over, or is now cutting for a second time. And the fact that he frequently finds a greater profit in such exploitation than he did at the first, leads many to conclude that such practice can be kept up indefinitely, if only fires can be kept out. Of course, he frequently can make more out of this so-called second-growth than he did out of the first exploitation, for the good reason that he now finds a ready market, and at remunerative prices, for everything on the ground; but, remember, he practically takes everything and leaves nothing for another harvest, and too frequently permits fire to kill what he does not remove. Whoever seeks another crop will "reckon without his host," and that fact must not be ignored. Somehow, we appear to lack a comprehension or a realization of the fact that it is the young trees and not the old ones that we must foster to ensure a perpetuity of our forests. In fostering such lies practical conservation of our forests. Mankind, without children, would soon cease to exist, and so would forests without young trees.

And then there are considerable areas where a second-growth is coming on which will become valuable in due time if not injured or destroyed by fire or disease, and this is the great hope of the many. But, unfortunately, the greater part of such areas have upon them mainly chestnut and oak—and the probable fate of such will be told later on for their condition is too serious to ignore. However much or little there may still remain of such forests is unknown, but whatever the amount may be it will be seen that we are not justified in concluding that they can be depended upon to produce, in the future,

the requisite amount of forest products needed; for, if for no other reason, they are being cut off too rapidly to stand the strain.

And now, after large experience as a lumberman, and from that experience having learned what only moderately close cutting, followed by fire, brings about, and that knowledge fortified by diligent study and careful observation of our forest conditions during more than 12 years' active membership of the Forestry Reservation Commission of our State, I can come to no other conclusion than that—of the 12,409,470 acres the non-agricultural portion just named—there is now, or soon will be, at least 60 per cent.—and I am much inclined to name 65 or even 70 per cent.—so devoid of uninjured trees of valuable species, or having on it such valuable species as are in the way of rapid extinction, that it must be planted to justify the payment of taxes and other necessary expenditures in care of it; but that if planted it will pay, in due time, a good annual profit as do the forests of Europe.

New Unfavorable Conditions.

It will be seen that in discussing the present condition of our forests the only reference that has been made to the causes that have brought them to their present state, are the axe of the lumberman and fires; and up to a comparatively recent date these were the only ones of moment, as disease and insects had done little substantial damage. But a different and a very serious destructive force now confronts us. Sometime in 1905, it was discovered that the chestnut trees on Long Island were all dying from a fungus malady—now commonly known as the "Chestnut Bark Disease"—which no doubt came to this country from China or Japan, for it is known to be common in both of those countries. The disease spread throughout all of the New England States, has ravaged New Jersey, a large portion of the State of New York, nearly all of eastern Pennsylvania—it is also found in the central and western parts of the State—Delaware, Maryland, Virginia, West Virginia, and even Kentucky and Ohio. The estimated damage already done in Pennsylvania runs from \$9,000,000 to \$10,000,000. The State has expended \$275,000 in an endeavor to find a preventive or a remedy and has succeeded in neither. No tree once attacked by it has ever been known to recover, and its virulence and rapid spread presage an early and practical extinction of that valuable tree. In Vol. XI, No. 1, page 40, of the Proceedings of the Society of American Foresters, Doctor Perley Spaulding, of the U. S. Bureau of Plant Industry, in speaking of the disease says:—"Apparently it will exterminate the chestnut tree. No forester is to-day depending on the chestnut for a crop. * * * As far as the forester is concerned the chestnut is out of the question for future operations." It may here be added that there is a well authenticated case where an ash and a pin oak, standing alongside of a chestnut that was killed by the fungus, died the next year, and apparently from the same cause.

Character of Our Forests.

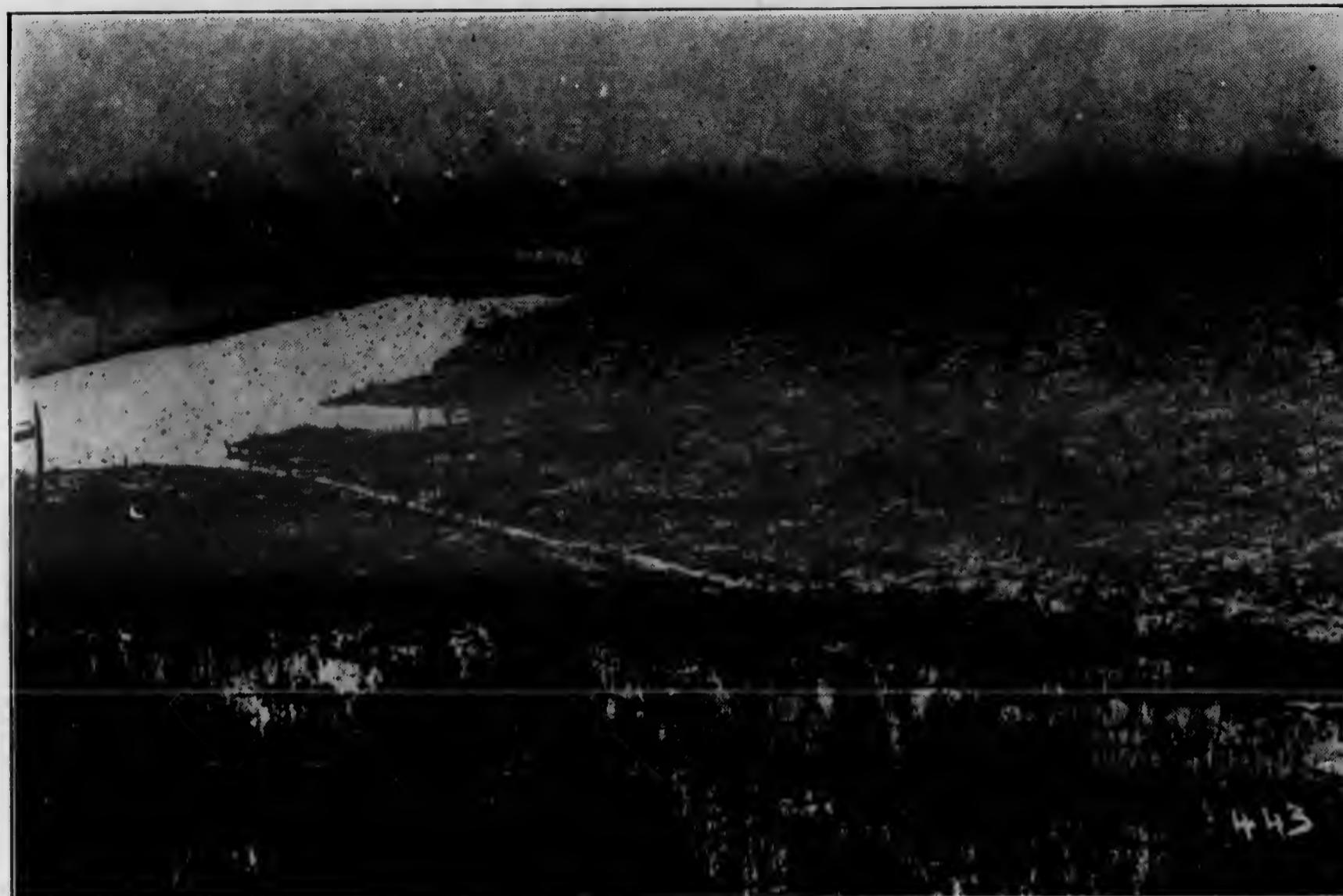
An examination of Pennsylvania's forests will disclose the fact that they are divided into two general classes. One is composed of chestnut and the

several species of oak, with a few other species occasionally mingled with these; and the other consists of pine and hemlock, with broad leaf trees of other species than chestnut and oak. Such examination will further show that substantially all of our otherwise promising, yet immature forests, those that have been, and by many still are, depended upon to grow into mature ones, are of the chestnut and oak class. This class will be found on many of the plateaus, and on the slopes and crests of our mountain ranges, and in many places where the merchantable crop has been harvested; and where, even after one and sometimes more fires have ravaged the territory, sprouts are springing up from cut chestnut and oak stumps, and even from roots of such species where fire has killed the stems. Practically all of the remaining 40 per cent. which I have assigned to the class that would not need aid in reforestation—and which if not stricken by disease or destroyed by fire, would bring forth eventually, and in good time, a forest of much value—can be placed in that category; but I fear all of it is doomed. Originally a large portion of the forests of the State were of this class, especially in the eastern, western, southern, and a portion of the central regions. The persistency of the chestnut to maintain itself, notwithstanding many adverse conditions and treatment, is well known; but it is unable to cope with the fatal blight.

Thus it will be seen that the almost certain loss of the chestnut tree—and along with it the pin and red oak, for a disease is playing havoc with these species too—develops a greatly disturbing factor in the restoration of the forests of the State. It is but proper to add that a large portion of our area which I maintain cannot reforest itself naturally has on it more or less chestnut and oak trees, but they are so weakened by repeated fires as to no longer possess power to send up healthy sprouts or resist disease; but even if they were not so enfeebled or confronted by the blight they are not numerous enough to play any commanding part in restoration; hence no reliance whatever should be placed upon them even if they should not be affected by the disease.

The Character of Forests Absolutely Necessary.

That the character—that is, their inability to become useful—of the trees standing on the 60 to 70 per cent. of this forest area—which percentage I contend must be planted to bring forth such a reforestation as our conditions demand—is not understood or comprehended is a great misfortune; for that lack of understanding and comprehension leads to apathy and contentedness where deep interest and activity should be supreme. With a great many people—and I fear they are in a large majority in our State—a tree is a tree in its fullest sense, and with them one species, for all practical purposes, is as good as another; and as they can see trees of some sort growing on a large portion of the cut-over and burned-over land, the conclusion is reached at once that a satisfactory restoration is taking place, and that all that is needed is to keep out fires—a something which everyone knows must be done no matter what is the character of the tree-growth or the system of restoration. While this mistaken notion has been referred to heretofore it is well to again call attention to it and add that there are many people who do not know that all trees are not alike good for lumber or any sort of for-



And now Pennsylvania has approximately 9,000,000 acres like this.



Modern method of Lumbering followed by Fire. Virgin forest in distance at left was cut and burned over in same manner.

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est products; in fact, a great many do not know one tree from another. Few are aware that of a trifle over 500 species of trees in the United States 70 per cent. of the lumber cut in the saw-mills of the entire country is—calling the white and yellow pines one species—from six species only, namely: pine, fir, spruce, hemlock, oak and cypress. As spruce and fir are not much in evidence in Pennsylvania and cypress never found here—and these combined yielded 20 per cent. of the total cut in 1914—they cut no figure with us and can be dismissed; thus showing that if we are to grow trees so as to maintain the ratio demanded for general use not less than 50 per cent. of the trees should be of pine and hemlock, or their substitutes the foreign conifers, such as Norway spruce, Scotch pine, and European larch, to which must be added sugar maple, black cherry, white ash, oaks and other well known broad leaf species. Sawed chestnut fell below two per cent. that year. Hemlock is a slow grower; and, what is more, with us will be practically exterminated in a few years.

It would seem that no argument should be required to show that restoration on this 60 to 70 per cent. of our forest land cannot be successful unless the trees composing the stand are of such species as will meet the demands of the consumer, and that they shall be sufficient in number and in a healthy condition. We would not deem him a successful farmer who sows or plants the poorest varieties of grain or grasses, or who is content with only one hill of corn where he should have eight or ten; or reaps only five bushels of indifferent wheat to the acre where he should get twenty-five of the best quality; nor would we consider him a good husbandman who would keep only a few cattle or other live stock, and these of inferior breeds, when he could as well maintain twice the number, and they of the best sort. And if we depend upon worthless species of trees now standing in great profusion on our forest land, or on trees that are low- and large-limbed, forked, crooked, and fire-scarred for a supply of lumber necessary to meet our wants for the future, when if by planting and properly caring for useful species a valuable crop of forest products would result, what better are we than the happy-go-lucky farmer? Will we show any more wisdom, or receive any greater rewards, than the one content with what little, and that of poor quality, he gets from his half-tilled acres?

Restoration of the Forests.

We have now seen how much non-agricultural land on which forests formerly grew lies within our realm, what injuries have resulted and are still being felt from the destruction of the forests once standing on it, and what is its present forestry condition, as well as what is absolutely needed; and also attention has been called to the difficulties confronting us, and we now come to the problem of determining what can and should be done with that land. To let such a vast area lie idle and useless should be unthinkable, and as it is unfitted for profitable agriculture, what better use can it be put to than the one that Nature herself ordained and carried on there? Trees grew on it once and will do so again if planted and are properly treated; and the growing of trees does not exhaust the soil, but enriches it with decaying leaves, wood, and bark. There is no other contribution to the public welfare that

this land is capable of making that will at all compare, both directly and indirectly, with its capacity and use in growing trees. Restoration of the forests, then, is clearly what we should turn our thoughts to and we should seriously consider and wisely determine the best method of accomplishing that end, for if we do not restore them the disastrous results that have been named will not only be perpetuated, but intensified.

If I have "blazed a trail" in our forest conceptions, when considering and describing their condition, that is quite apart from that which so many people follow, it soon will be seen that my divergence is far greater when I indicate what I deem the best method to pursue. I am aware of the gravity of that departure, but hope to give good reasons for it. I certainly realize, as every one should, that mistakes in forestry are of long life, and moreover expensive. We should start right if we can find out what is right; and I must be allowed to say that the views I shall here advance are founded upon close study, for quite more than half a century, of the forests of our country, and especially those of our own State, and are reinforced by a knowledge of European systems which have been followed there for more than 200 years. Yet I must add that we cannot safely follow present European practice in the management of our forests, for our conditions are vastly different from theirs. What we advantageously can take from present European practice, and it is about all that is now applicable, is *how to grow new forests*, and not, necessarily, *how to exploit them after restoration*. Exploitation of mature forests will come to us later on; but we must grow them first. We have no such forests in Pennsylvania as are to be found in Europe where scientific forestry has been practised for the time mentioned. European foresters have mature forests to deal with in both exploitation and renewal, and it has been shown that we have comparatively little of mature forests in our State, and that little is doomed to early destruction and without any attempt at renewal. Pennsylvania must devote her energies, for the coming 60 to 75 years, to growing forests; else, by that time, she will find herself practically destitute of forests of economic value; and a recognition of actual forest conditions is essential to the formation of a correct opinion as to the best course to pursue. Remember this fundamental fact, that without trees there can be no forestry.

"The rest is all but leather and prunella."

Methods of Restoration.

Now, it is not disputed that, certain conditions prevailing, forests can be maintained in more or less productive perpetuity through what is known as "selective cutting," that is, taking out the mature trees and leaving the smaller ones to grow to maturity—providing disease, insects, or other injury do not prevent—but the great dominating fact with us is, that we do not possess forests of mature trees.

It may be claimed that the system of selective cutting should prevail when the present so-called second growth forests are being exploited; but the economic truth is that no lumberman can afford to, nor will he, go on such tracts and take only the mature trees as they slowly present themselves. Besides, he finds a market for everything on the ground, old and young, great and small, and European experience is that it is far better to cut even mature

forests clean and immediately plant than attempt to let unaided Nature renew the forest. In Europe there are few so-called "weed trees," that is, trees that have no commercial value for forest products, while we have a large number in practically all of our forests, and as ours are all prolific seeders and rapid growers, they preempt the ground to the exclusion of valuable species; and what use, then, is it to attempt an impracticable scheme?

Speaking in a general way, then, there are two methods of restoration optional with us. One method, called Natural Regeneration, is to keep fires from our cut-over and mainly burned-over lands, and trust to Nature to do the rest—and she may do her work either by sowing seeds from trees left, or by sending up sprouts from cut stumps. The other method, designated Artificial Restoration, is nothing more nor less than gathering seeds of valuable species, planting them in nurseries, and when large enough, placing the little trees where they are to stand and mature in the forest. By natural regeneration we must accept such species as Nature sees fit to give us. By the other method, we have full control of the species, and the yield will be much greater and of better quality.

As every one should know, Nature has but two ways to reproduce trees suitable for economic purposes, and these are either by sending up sprouts from the roots of growing trees, or from stumps of trees which have been cut, or from roots of trees which, in some way, have been destroyed; and by sowing seed. We have seen that hereafter no dependence can be placed on the chestnut, and it must be added that the chestnut is the one, *and the only one*, of all of our valuable timber trees that can be relied on, with any degree of certainty, to reproduce itself by sprouts that will ever reach a size suitable for general use. Some others, as basswood and yellow poplar, occasionally when small, will send up sprouts from the roots, but so seldom do such sprouts attain a size large enough for merchantable lumber that no reliance can be placed upon them; besides, there are not many of those species to be found. Other trees, like the oaks, will sprout from a cut stump, if the tree cut is not large, but sprouts from these seldom reach more than pole size before decay at the roots sets in. Pines and hemlocks never sprout, nor will maple, birch, cherry, or ash sprout to amount to anything when the tree cut is of sawlog size.

From this it must be seen that, with the chestnut no longer to be depended upon, no reliance can be placed on sprout growth to produce a forest of much economic value. That all this is contrary to general belief is, unfortunately, too true. A belief that sprout growth can greatly aid, if not actually accomplish, the restoration of a forest on cut-over land undoubtedly arose from the fact that chestnut would do that; and without investigation, the conclusion was reached that all other trees would do the same; but when people come to understand that our forests must be renewed only through seeds sown in some way, they will have come to a knowledge of a very important and fundamental fact in forest restoration in our State.

What Method of Seed-Sowing Can We Depend Upon?

If we cannot grow satisfactory forests from sprouts we must then depend entirely on seed-sowing in some form, and whether best by Nature or

by man a little investigation will show. After our timber trees—and none others are embraced in this discussion—reach the age of 25 or 30 years—seldom before that—they begin to produce seed, sparingly at first, but, as age creeps on, they generally yield it in great abundance at times, yet rarely annually. White pine does not yield seed oftener, on an average, than once in six years, sometimes not more frequently than once in 10 years. Oaks seldom seed oftener than once in four or five years, nor do any other of the broadleaf trees, except chestnut, which is about the only one that does so annually, but that not always. Notwithstanding all this, Nature is prodigal with her seeds. She produces and sows millions to where one sends forth a tree. To produce trees, the seeds must fall in suitable places to germinate and grow, and if these conditions do not exist, or the seeds are in any way destroyed, no reproduction can occur, and this failure to reproduce trees through natural seed-sowing in the forest is something that those who advocate natural restoration should investigate before insisting upon its adoption; and if they will do so they will then see how little dependence can be placed upon it. Naturally Nature restores her forests slowly, only as fast as trees mature and die; but we are asking her to do it with lightning rapidity. Instead of an average of two, three, or may be five, per annum, per acre, we are demanding a vastly greater number in that time. She has no need to hurry; all the future, as has been all the past, is hers.

I would like an estimate from some advocate of natural seeding of the probable length of time required, by unaided Nature, to properly reforest an acre of ground having on it, say, five, ten, twenty or even fifty seed trees so placed; and of such ages, as an average acre of our cut-over and burned-over lands will show; but I do not expect a response. There are two features which the advocates of natural seeding do not seem to take cognizance of, and they are the destruction of seeds by mice, squirrels, birds, and other seed-eating animals, and the failure of the seed not destroyed to germinate. This destruction and failure to germinate is so great that so-called "broadcast sowing" by the United States Forest Service—where from two to three pounds of pine seeds were used to the acre, a pound containing about 28,000 seeds—has proved a failure, but few trees showing; and experience in our State has been no better.

Irregular Yield and Defective Character of Stand.

Again:—unless seed trees are evenly spaced—something which, under the law of probabilities, might not occur once in 100,000 times with natural seeding—there would be no evenness of stand, a condition which is essential to the production of good lumber. Besides this some of the seed trees might bear seed at once while others—for they doubtless would be of all ages—would not do so for several years, and the whole area be liable to be filled with worthless stuff. If the winds fail when the seeds are ripe and fall, then they are not scattered; or if the winds blow in the same direction each time, which is more than probable, then there is an excessive seeding in some places and none in others; and in the case of nut-bearing trees dependence must be placed on squirrels, mice, birds, or other nut-eating animals to sow the seeds if any such trees are to be brought forth. So irregular is the result



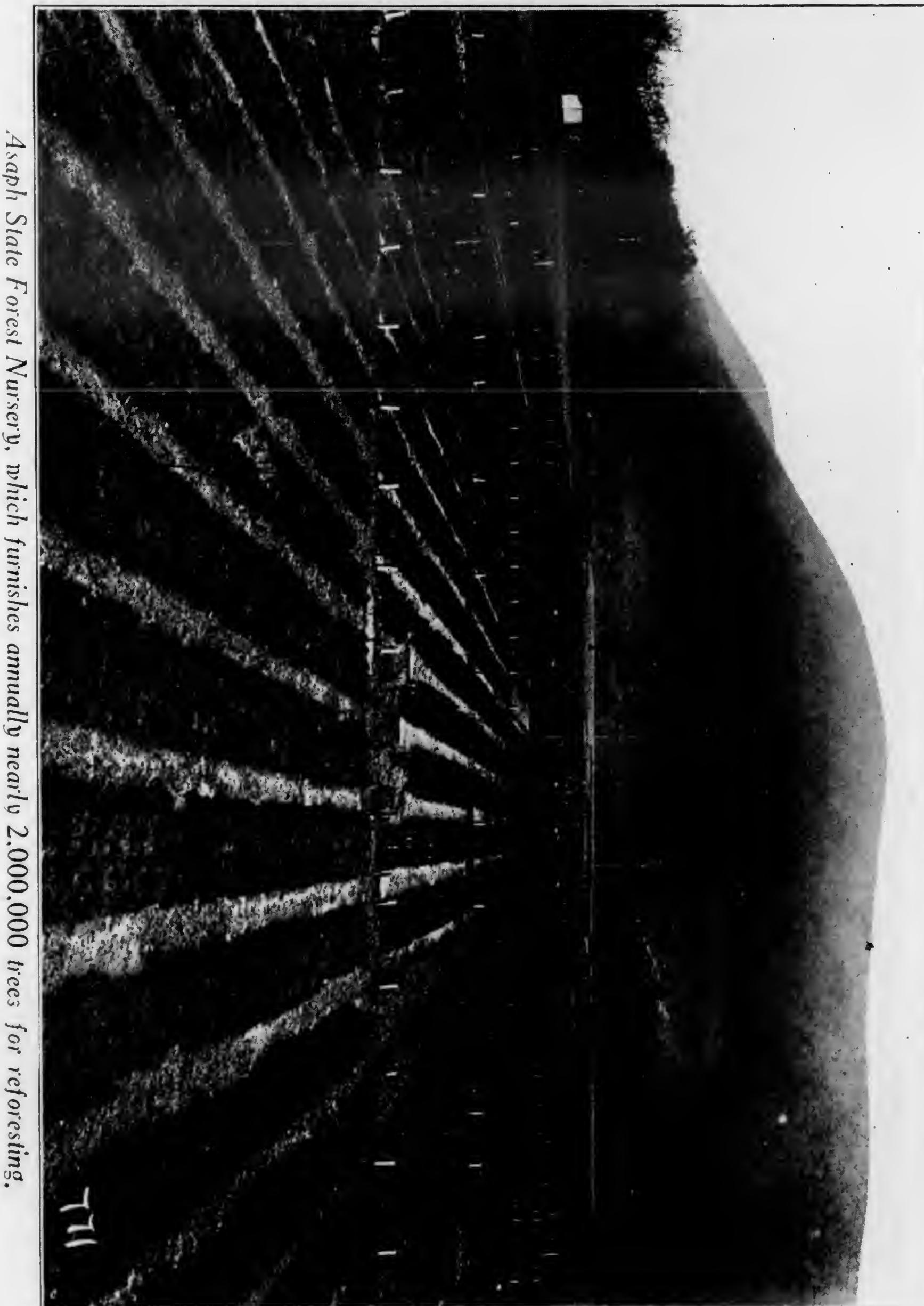
Asaph State Forest Nursery, which furnishes annually nearly 2,000,000 trees for reforesting.

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I would like an estimate from some advocate of natural seeding of the probable length of time required, by unaided Nature, to properly reforest an acre of ground having on it, say, five, ten, twenty or even fifty seed trees so placed, and of such ages, as an average acre of our cut-over and burned-over lands will show; but I do not expect a response. There are two features which the advocates of natural seeding do not seem to take cognizance of, and they are the destruction of seeds by mice, squirrels, birds, and other seed-eating animals, and the failure of the seed not destroyed to germinate. This destruction and failure to germinate is so great that so-called "broadcast sowing" by the United States Forest Service—where from two to three pounds of pine seeds were used to the acre, a pound containing about 28,000 seeds—has proved a failure, but few trees showing; and experience in our State has been no better.

Irregular Yield and Defective Character of Stand.

Again:—unless seed trees are evenly spaced—something which, under the law of probabilities, might not occur once in 100,000 times with natural seeding—there would be no evenness of stand, a condition which is essential to the production of good lumber. Besides this some of the seed trees might bear seed at once while others—for they doubtless would be of all ages—would not do so for several years, and the whole area be liable to be filled with worthless stuff. If the winds fail when the seeds are ripe and fall, then they are not scattered; or if the winds blow in the same direction each time, which is more than probable, then there is an excessive seeding in some places and none in others; and in the case of nut-bearing trees dependence must be placed on squirrels, mice, birds, or other nut-eating animals to sow the seeds if any such trees are to be brought forth. So irregular is the result



Asaph State Forest Nursery, which furnishes annually nearly 2,000,000 trees for reforesting.

where natural seed-sowing is carried on in Europe—but there under altogether different and more favorable conditions than can prevail in our State—that it is acknowledged that a full stand cannot be secured by that method under 30 years, at least, and then the trees will be of greatly varying ages, something that should be avoided if possible.

Density of Stand Necessary.

In addition to the failure to germinate or be evenly spaced is the fact that, with natural seeding, some of the trees will have attained so large a size before the youngest ones have made any notable growth, that the result will be that the trees first produced will grow largely in the open, and consequently, will be low- and large-limbed, and will yield but little lumber, and that of poor quality. Every observant person can see that a tree of any given species, when grown in the open—that is, not crowded by neighbors—will take on a decidedly different form from that of one grown in a dense stand, whether of its own or a different species. That in the open will have large limbs on the stem from near the ground upward, will not grow tall, and much of the wood the tree contains will be in its limbs where it is of little or no value. At best it will yield only one, may be two, sawlogs, and the lumber cut from such will be filled with large knots and be of little worth when compared with that cut from logs from trees grown in a dense stand. If the dense stand is evenly spaced, and that is essential, the trees will grow tall, their limbs will be killed when small for want of light, and, consequently, decay early and drop off, causing the tree to be free from limbs for much of its height; and such trees may yield four and even up to five sawlogs, and the lumber cut from them will have a large percentage of high grade, something which the other cannot produce. Therefore, it can be set down as a fact which cannot be successfully controverted—for every lumberman will testify to it—that trees grown so far apart that they have large limbs from near the ground up, or more correctly speaking, are low- and large-limbed, produce wood worth little except for fuel or purposes which do not demand dressed lumber, and consequently, are of little value when compared with trees that are tall, straight, and free from large limbs. I cannot take space to explain why or how this comes about, but every student in dendrology is aware of the reason, and every lumberman knows the fact. In controlling the density of the stand, through close planting and even spacing, lies the power of the forester to compel trees to so grow as to produce first class lumber.

Time an Important Feature.

Every one must realize that time is an important feature in the restoration of our forests. If 30 years are required to secure a full stand by natural seed-sowing—and that under the most favorable conditions—there must be added from 60 to 75 years before all of it will be mature; and can we afford to wait when, by following another system, we can establish a full mature stand in from 60 to 75 years, and the product of the best quality?—something which natural seeding cannot bring about in any acceptable time. Now, how can this latter result be achieved? The answer is, through artificial restoration, which, as already stated, is by gathering seeds of suitable

species, sowing them in nurseries and when the trees are large enough—generally when from one to five years old, according to species and condition of ground in which they are to be placed—planting them in the forests where they are to grow to maturity. That is the practice in Europe where very productive forests are to be found. Ninety per cent. of the German forests are grown in this way. Little Switzerland annually plants 22,000,-000 trees; Saxony has an acre of forest nursery to every 1,000 acres of forest. Natural seeding is carried on there to a limited extent only, and when it fails, as it frequently does, planting is resorted to.

Cost and Yield.

But I am met, no doubt, with the objection that this system is expensive, more so than the other; but before it is condemned because of its first cost just compute the results of natural seeding, taking into account taxes and interest on land, with risks and cost of care for at least 30 years longer than by the method I suggest; and above all, figure the difference in time of maturity, quality, quantity and value of product and you will find the balance largely in favor of planting. The average yield per acre of our virgin forests was not in excess of 12,000 board feet, and that which can come from our cut-over and burned-over land, if not planted, by no means will equal that, while European planted forests run from 45,000 to 60,000 board feet at 75 years of age, and the product is of better quality than can be produced by natural regeneration from our cut-over lands in 200 years; but if planted, the yield will be more than quadrupled. European countries can afford to plant, and do plant, where the value of the land is far greater than with us, in some cases six or seven times as much. Remember this certain thing: no matter what it may cost to establish forests in this country, the price of lumber in the market, at the time that trees planted now become financially mature, say, 75 years hence, will be the cost of production, plus a fair profit. By that time the supply will have become so exhausted and the demands so increased—and forest products are an absolute necessity—that they will stand in the same line with other needful products of the soil, none of which will be produced without a reasonable profit.

Necessity of Reforestation.

I am well aware that, after all I have said about our forest conditions, a large number of my readers stand ready to pointedly ask why it is that restoration of our forests has become a necessity? or why should we, of the present time, incur all this labor and expense? or have we not got along reasonably well in the past, and are we not doing fairly well now? Yes; we have got along reasonably well in the past, and are doing fairly well now. So, too, for a time, the farmer would get along quite well who would feed his seed wheat and seed oats to his horses, his seed corn to his hens, and himself, family and pigs eat up his seed potatoes; but when these were exhausted, and there were none to be purchased because others had done the same thing, the supply for the future would be a matter of great importance to him; and the people of this Commonwealth stand, in the matter of a supply of forest products for the future, just where the farmer would stand did he

permit his store of seed to be consumed, with no chance of obtaining more. If we are patriotic citizens, we cannot indifferently contemplate the loss of the forests. We should, and patriots will, provide for the State's future prosperity.

It is true that we have within our borders, or can secure elsewhere, a sufficient supply for say, 20, 30, may be 50 years; but what then? We cannot go elsewhere after that, for all other states and countries are exhausting their supply just as fast as we are ours, and few of them have even the home supply that we have, and by the time ours is gone, theirs will be also, if not before. Inevitably all this would occur abroad in times of peace, but the awful destruction of the forests of Belgium and France, added to the forced complete absence of care of existing forests, and the necessary work in establishing new ones, which the war has brought about in Germany, Austria, and Italy, as well as in France and Belgium, will greatly lessen the future timber supply, as well as increase the needs, of all of these countries. At their best, in times of peace, France, Germany, and Belgium were forced to import one-third of all the forest products they consumed, notwithstanding they were the foremost nations in the world in growing forests. Austria merely supplied her own wants, while Italy was compelled to depend largely upon others to furnish what she needed. Greece, Turkey, and Servia have not produced, for a long time, the amount they consumed. Russia alone of those engaged in the war has more forests than she, at present, needs and hers will be the least affected by the conflict; but the great distance that her forest products must be transported to the consuming nations will be a heavy burden upon those who must have them.

What Is Going On in Our State.

Now, I am not going to further attempt to show that forest products are an absolute necessity. One who does not recognize that fact, and dreams that substitutes will be found, cannot be reached by any argument based on observation and common sense; but I do propose to show what is going on in our State, and from that showing anyone can see what are our prospects for a future supply. I full well know that my showing is likely to be denounced as a cry of "wolf" when there is no wolf now seen; yet it should be remembered that the wolf came in good time. But let us see how we stand.

For a long time, even up to within some few years ago, Pennsylvania led every State in the Union in the production of lumber and other forest products. Today she stands down 18 in the list, and instead of liberally providing for others, as of old, she is fast falling behind in supplying even what she consumes. According to the latest statistics—Pa. Forestry Department Bulletin, No. 9, 1912—the amount of lumber used in the many manufacturing industries in our State, from July 1911 to July, 1912, was 1,114,-000,000 board feet. Of this amount only 313,683,000 feet was produced in Pennsylvania, showing that 800,417,000 feet was imported from other states or countries. This 800,417,000 feet that was brought into and used in the manufacturing industries, that is, in our planing mills, box factories, sash and door factories, furniture factories, etc., etc., does not include any lumber of any kind that was dressed or made into any article before ship-

ment here, nor any cooperage stock, pulp wood, railroad ties, shingles, lath, telegraph or telephone poles, or anything of that sort brought here. All that was additional to the 800,417,000 feet used in the manufacturing industries. No statistics of the amount imported and not used in our manufacturing industries appear to have been secured, and only conjecture can be given as to what it was; but it certainly is safe to assume that more than enough was imported as dressed lumber, such as flooring, siding, ceiling, and the like, and of rough lumber, as planks, joists, and other dimension stuff, as to overbalance the exportations of all lumber cut within our borders, and raise the sum imported and used in our industries and elsewhere, up to a full round billion feet. In other words, Pennsylvania used in that year a billion feet more lumber than she produced, and it may be added with undoubted truth, that she never since has lessened that sum for any year, but on the other hand, has increased it and will continue to do so for the future.

Who Can and Who Should Undertake Restoration of Our Forests.

By no means has all been told concerning the restoration of our forests, but enough has been set forth to warrant taking up the question as to who can and who should engage in that work. It should be borne in mind, when discussing that problem, that it is one which concerns every citizen of the State. No one can rightfully say "I have no interest in it; it does not concern me; it is not in my line of business," for the truth is that he has an interest in it and it does concern him, and if it is not in his line of business he should make it so. Everything which relates to the welfare of the State at large, as does this, reaches back to every citizen.

First, then, in the line of those who can and who should undertake and carry on restoration on the non-agricultural lands of the State, is the State government itself. One of the purposes of government, as prescribed in the preamble to the constitution of the United States, is: "to promote the general welfare," and this duty rests equally imperative on each State composing the Union, whether or not it is so decreed in its organic law. Furthermore, if the restoration of the forests—it being a work of necessity—is of so great a magnitude, or is so expensive that, unaided, neither municipal, corporate, nor private enterprise can successfully carry it out, then it follows that the State government should step in and take upon itself that which others alone cannot accomplish; or in some practical way, to aid them to do so.

How far, then, should the State undertake to own land and carry on reforestation? and how much, and in what way, if at all, should it give aid to municipalities, corporations, and individuals? That it should undertake to do the whole work is manifestly impracticable. It should do a reasonable share and leave to others that which the State cannot consistently do. That it already has entered upon the work of purchasing land and is reforesting it is well known and, as formerly stated, it now owns a round million of acres and is carrying on reforestation as fast as appropriations of money for that purpose will allow.

That it should continue to purchase land until it possesses 6,000,000 or 7,000,000 acres is an opinion expressed by several men prominent in affairs of our State. But that matter needs careful and thorough consideration.



Planted Forest Showing Necessary Density of Stand. White Pine Ten Years Old



Virgin Forest of White Pine, from one hundred to two hundred fifty years old. Note straightness of all trees; result of dense growth.

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Virgin Forest of White Pine, from one hundred to two hundred fifty years old. Note straightness of all trees; result of dense growth.

Do those who hold that opinion realize the magnitude of the undertaking? My firm belief is that they do not. Have they computed the cost of purchase and restoration? I do not think so. Have they any clear cut, well thought out, comprehension of what the condition of the forests on that land would or should be 50 years hence? I do not believe that they have any correct conception of either. Now before we jump into that kind of a job, let us first see something as to what it will likely cost and, what is of equal importance, what work must be done to make the enterprise a success. The 1,000,000 acres which the State now owns has cost, for purchase, very close to \$2,250,000 and a full \$2,375,000 more for administration and improvements. The annual expenditures are now \$300,000, and this sum does not include anything for the purchase of land. Such sum is expended only for administration, improvement, and, as far as appropriations will allow, for planting; and all told, there have not been planted during the existence of the Forestry Department as many trees as we should plant in one year. The total money returns from this investment of over \$4,625,000 have been a trifle over \$118,000, and even if no more planting is to be done annually hereafter, the annual expenses must continue to be what they now are—with an unknown revenue,—and that does not look much like a paying undertaking; and it should be understood that if dependence is to be placed only on such trees as now stand on the State land, it never will pay, for the money the trees will bring when mature will not equal that which must be paid out for their care and protection. It would require an annual cut of 50,000,000 board feet at a stumpage value of \$6 per thousand to meet it, and in what condition would that leave the forest 50 years hence—if the stand could meet that drain—if adequate planting shall not be resorted to? “Watchful waiting” for the trees that now stand on State land, or on other like areas, will not do. There must be “preparedness” and that preparedness must consist, as heretofore urged, in planting and growing new forests; and sufficient appropriations should be granted for the purpose; and when that is done the value of the product, when mature, will be equal to the cost, to say nothing of the benefits indirectly derived from such restoration. This whole matter of reforestation has been successfully threshed out in Europe during the last 200 years, and why cannot we accept and profit by the results of experience there instead of traveling the same road, with the same load, for that length of time, and finally arriving at the same place with the same results?

How Can Funds Be Provided?

A large amount of money will be required to carry on State work so that the investment will pay in the end, and it may be found advisable to so amend our State constitution that money can be obtained, as needed, on long time bonds, whereby, those who are to come after us, and who will be most benefitted, will have to look after their redemption, which undoubtedly would be well provided for from the receipts of the forests, when mature, that would be planted and cared for with the funds so obtained. Therefore, if funds for carrying on the work of reforestation by planting should be provided for, and the organic law establishing the Department of Forestry be so amended and modified as to clearly set forth its purposes and direct its

work, I can see no reason why a much larger area than is now owned by the State should not be secured, even as much as that just named; but unless both these things are done—funds provided for, and change made in the organic law creating the Department of Forestry—I can see no reason for increasing the State's present holdings, certainly not unless funds to be used for planting shall be more generously supplied than heretofore.

Others than the State Should Engage in the Work.

Municipalities, and largely corporations, are not limited in duration of life as is an individual, and for that reason, they should come before the individual and take upon themselves a reasonable part of the work of reforestation. Municipalities in Europe—there classed as "communes," and standing in the same relation to the public as our boroughs, cities and counties do here—are largely engaged in practical and profitable forestry, some of them receiving a net annual revenue of from \$2.25 to \$6.00 per acre, and that without any aid in relief from taxation, or in the guaranteeing, by the State, of interest on the investment. If the cities' and boroughs of our State should secure land for the protection of their water supply and practise forestry upon it they would not only receive a benefit from that feature, but it would provide a revenue in due time which would aid, as in some European countries, in reducing the tax levy. Many counties in our State are peculiarly circumstanced. In such counties there is more or less land sold every three years for delinquent taxes. If no purchaser comes forward, the county must take it, and if not redeemed, it must be sold again at the end of three years, and so on indefinitely. If the law should be changed, so as to provide for permanent ownership, and the authorities empowered to purchase such land as might be needed, the county could engage in forestry under supervision of the Forestry Department. This would give local management and lead to local interest in protection from fire as well as a general interest in forestry. There is a law in our State authorizing municipalities to engage in forestry, but it lacks the right of eminent domain and has never been accepted by any.

After the municipalities should come the corporations, such as railroads, mining companies, etc., and especially paper manufacturers, and be followed by trust companies and the like and by individuals. As the individual cannot see returns from forestry in an ordinary lifetime, he is forced, unless in the case of the farmer with his wood lot, to consider the matter more or less in the light of a patriotic duty; yet if he desires to provide for those who are to inherit what he may save for them he cannot do better than to give them a forest, something which will be more certain than a life insurance.

Should the State Aid Others in Reforestation?

We now come to the question whether the state should aid any of the parties named. It already has on its statute books a law whereby parties can place their immature forests in a class called Auxiliary Forest Reserves, and the land upon which such forests stand cannot be assessed for more than one dollar per acre until the trees are matured and cut, when a tax of ten per cent. of the stumpage value of the trees cut shall be collected. This act applies alike to municipalities, corporations and individuals, and it is an advance



Second growth of White Pine. No large limbs to be seen. Some young growth coming on in the open but none elsewhere. Age of stand probably about 40 years. Diameter breast high from 10 to 12 inches. Yield at 50 years of age not less than 40,000 board feet per acre.

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step in aid of reforestation, and stands to the credit of Pennsylvania as being the pioneer in giving relief along that line. But in such cases, as it should be in all others where relief is given in any way by the State, such forests are under State supervision.

But should the State go further in aid of municipal reforestation? In my opinion there should be a constitutional amendment giving counties the power to issue long time bonds to obtain funds to promote forestry within their limits, and that the State should guarantee the interest thereon, holding a lien on the land and forest to secure itself. Such bonds should be as readily negotiated as "timber bonds" now are. In such cases, it would be to the interest of the local authorities to protect the forests and see that they are properly managed and cared for, for if not the State could take them over at any time there was neglect. We may not be ready for this now, but it will come, or something like it, in due time.

Will Reforestation Pay?

The primary, fundamental question with all parties named is, will reforestation pay? and in that light it must be considered. As stated, it pays in Europe in direct and profitable financial results and it will so pay here if rightly managed, but it will not thus pay unless protection from fire and relief from burdensome taxation be positively assured; neither will it pay here, even if these are secured, unless new forests are established by planting valuable species of trees and taking care of them. Yet neither are its direct financial features, nor the benefits which have been referred to—such as regulating the water flow, preventing erosion, restoring the beauty of the landscape, etc., etc.—the only ones to be considered. There are other important features which deserve recognition and which go to make restoration of our forests a paying undertaking. It will make a vast area now practically unproductive a productive one. It will more than "make two blades of grass grow where but one grew before". Nor is this all. The amount of labor required to restore and maintain in perpetuity the forests on the non-agricultural lands of the state will necessarily greatly increase the population of these areas—areas which now are nearly destitute of people and will remain so until reforestation is undertaken—and it will give constant employment there for a large number in planting and caring for the trees, harvesting the forest crop, as well as performing other necessary labor; and this, together with the manufacture elsewhere, into useful commodities, the raw material that will be furnished by the forests, will require, all told, as many persons, in one way and another,—persons whose services would not be required were it not for forest restoration—as would be necessary to carry on agriculture there were the whole area fit for such use and so devoted. Thus in addition to direct and profitable financial results, will a now unproductive territory be made productive, our population be increased, opportunities for labor be added, the people be served with absolutely necessary forest products, the prosperity and welfare of our state be maintained, and one of her most important natural resources be conserved.

Knowledge of Existing Conditions Necessary.

From what I have said it will be seen that progress in matters of forestry in our State must wait upon acquisition by the public at large of a knowledge of existing conditions, and as a result of that knowledge, encouraging and sustaining legislation. To go on as we now are doing is only to invite failure in the end. Reforestation of the non-agricultural land of our State, and bringing it to a profitable issue, is the most pressing and far-reaching problem we have ever had before us for solution; and I will add that there is none greater. The greatest difficulty in working out a satisfactory solution is a lack of knowledge of actual conditions, and an absence of thought and care for the future. There is one very important thing that all should recognize, and that is, that there should be no action, or neglect of action, which does not look to the future prosperity of the Commonwealth. We never contemplate the death of the State. We deem its life to be perpetual. We know it is our duty to maintain its existence and prosperity now, and that such duty devolves on the present generation. We also know that it is the duty of the State to provide for the present and that it is no less its duty, and that of the people of today, to prepare for the future.

But aside from a lack of thought and care for the future many men, intelligent and well versed in most matters of public policy, are lamentably ill-informed or are without practical knowledge of existing forest conditions and of what is needed to reforest our State. They have not made investigations but have assumed that Nature would produce new forests as fast as we cut them down; and that is a fatal assumption. Unless the people, and after them the legislature, shall get the idea out of their minds that all that is required to reforest our State with valuable species of trees—and to permit any others as substitutes would be a monumental blunder—and to maintain such forest in perpetuity, is to keep out fires—something which should be done with all forests—there will be no advance in the great work. A saner view than that must fill the minds of the people or irreparable disaster will surely follow.

Reynoldsville, Penna., July 15th, 1916.

S. B. ELLIOTT.

End of
Title